D2.2 Gene expression (HL)

What the Cell · DP Biology · worksheet · HL statements D2.2.1–11

Name _____ **Date** _____ **Total** _____ / 40

About 40 minutes, or one section at a time. The number of marks shows how many separate points to make.

Section A: Recall

10 marks

1 **Define** transcriptome. D2.2.5 **[1]**

2 **State** where activator proteins bind to DNA. D2.2.2 **[1]**

3 **State** two stages of gene expression. D2.2.1 **[2]**

4 **State** which base in DNA is methylated. D2.2.6 **[1]**

5 **State** what happens to the poly-A tail of an mRNA before the mRNA is broken down. D2.2.3 **[1]**

6 **State** which species is the father of a liger. D2.2.9 **[1]**

7 **State** why monozygotic twins are useful for studying effects of the environment. D2.2.10 **[1]**

8 **State** one environmental factor linked to changes in DNA methylation in humans. D2.2.8 **[1]**

9 **Name** the sugar that switches on the genes for its own breakdown in *E. coli*. D2.2.11 **[1]**

Section B: Understanding

14 marks

10 **Explain** how enhancers and transcription factors can increase transcription of a gene. D2.2.2 **[3]**

11 **Distinguish** between an epigenetic change and a mutation. D2.2.4 **[2]**

12 **Explain** how a liver cell passes its pattern of gene expression to its daughter cells. D2.2.7 **[2]**

13 **Explain** why most epigenetic tags are removed in the formation of gametes. D2.2.9 **[2]**

14 **Explain** how a steroid hormone such as oestradiol changes gene expression in a target cell. D2.2.11 **[3]**

15 **Explain** why the proteome of a muscle cell differs from that of a skin cell in the same person. D2.2.5 **[2]**

Section C: Working with evidence

10 marks

All data in this section are invented for practice. The patterns are realistic.

16 D2.2.8, D2.2.10

DNA methylation was compared between the two members of pairs of monozygotic twins. The table shows the mean number of genome regions where the twins' methylation differed.

Group of twin pairs	Number of pairs	Regions with different methylation
Aged 3	20	1200
Aged 50, all	20	5200
Aged 50, lived together most of their lives	9	3600
Aged 50, lived apart most of their lives	11	6800

a **Calculate** how many times more regions differed in 50-year-old twins than in 3-year-old twins. **[1]**

b **Describe** the effect of living apart on the differences in methylation. **[2]**

c **Explain** why these differences cannot be caused by differences in genotype. **[2]**

d **Suggest** two environmental factors that could cause the differences. **[2]**

e **Evaluate** how far these data show that the environment changes gene expression. **[3]**

Section D: Longer answer

6 marks

17 **Discuss** the evidence that changes in gene expression can be inherited without changes to the base sequence of DNA. D2.2.7–9 **[6]**